Spor Bilimleri Araştırmaları Dergisi
Journal of Sport Sciences Research
Vol.: 8, Issue: 2, June, 2023
E-ISSN: 2548-0723
URL: http://www.dergipark.org.tr/jssr

Game-Related Statistics Discriminating Winners and Losers in Turkish Basketball Super League: Effect of Home-Away Games

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Research Article
DOI: 10.25307/jssr.1233412
Received: 12.01.2023 Accepted: 03.04.2023 Online Publishing: 30.06.2023

Abstract

The purpose of this study was to examine the game-related statistics that differentiate winning and losing teams in the Turkish Basketball Super League based on game location. The data were obtained from the Turkish Basketball Federation's official website (https://www.tbf.org.tr/ligler/bsl-2020-2021/maclar). The data of 258 matches of the Turkish Basketball Super League for the 2020-2021 season were included in the study" is better. After obtaining the data from the official website ball possessions, offensive efficiency, and defensive efficiency were calculated using Oliver's formula. Following that, all game-related statistics except shooting percentages were normalized by ball possessions. A discrimination analysis was performed on the data. The results of the study showed that 3pt% (SC = .312) and defensive rebounds (SC = .334) were determinants to win home games while 2pm (SC = .416), 2pt% (SC = .364), defensive rebounds (SC = .305) and assists (SC = .365) were determinants to win away games. When all games considered, 2pm (SC = ,341), 2pt% (SC = .310), 3pt% (SC = .322), defensive rebounds (SC = .333) and assists (SC = .349) were important game related statistics to win games. Coaches could use the findings of the study to enhance their coaching process and prepare their teams for the upcoming games.
Keywords: Discriminant analysis, Basketball, Home advantage, Game location, Game-related statistics.

Türkiye Basketbol Süper Ligi'nde Kazanan ve Kaybeden Takımları Birbirinden Ayıran İstatistikler: İç Saha-Dış Saha Etkisi

Öz

Bu çalışmanın amacı, Türkiye Basketbol Süper Ligi'nde kazanan ve kaybeden takımları birbirinden ayıran maç istatistiklerinin iç saha ve dış saha durumuna göre incelenmesidir. Veriler, Türkiye Basketbol Federasyonu resmi internet sitesinden (https://www.tbf.org.tr/ligler/bsl-2020-2021/maclar) alınmıştır. Türkiye Basketbol Süper Ligi'nin 2020-2021 sezonuna ait 258 maç verisi çalışmaya dahil edilmiştir. Veriler, resmi web sitesinden çekildikten sonra topa sahip olma, hücum verimliliği ve savunma verimliliği değerleri Oliver'ın formülü kullanılarak hesaplanmıştır. Bunu takiben, şut yüzdeleri dışındaki tüm maç istatistikleri topa sahip olma durumuna göre normalleştirilmiştir. Veriler üzerinde diskriminant analizi gerçekleştirilmiştir. Analiz sonucunda üç sayı yüzdesi (SC = .312) ve savunma ribaundlarının (SC = .334) iç saha maçlarını kazanmada belirleyici olduğu; iki sayı isabeti (SC = .416), iki sayı yüzdesi (SC = .364), savunma ribaundlarının (SC = .305) ve asistlerin (SC = .365) deplasman maçlarını kazanmada belirleyici olduğu tespit edilmiştir. Tüm maçlara yönelik olarak gerçekleştirilen analiz soncunda ise iki sayı isabeti (SC = ,341), iki sayı yüzdesi (SC = .310), üç sayı yüzdesi (SC = .322), savunma ribaundları (SC = .333) ve asistlerin (SC = .349) kazanan takımlar açısından belirleyici istatistikler olduğu saptanmıştır. Bu çalışmadan elde edilen verilerin, antrenörlerin koçluk süreçlerini geliştirmede ve takımlarını yaklaşan maçlara hazırlamada faydalı olacağı söylenebilir.
Anahtar kelimeler: Diskriminant analizi, Basketbol, İç saha avantajı, Maç lokasyonu, Maç istatistikleri

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INTRODUCTION

Technological advancements have greatly improved the ability of coaches to generate data that provides a comprehensive description of the performance of individuals or teams. Coaches use performance analysis as a crucial technique to gather accurate information about both their team and opponents in team sports. Many studies have investigated the game-related statistics in team sports like football (Mendes et al., 2007), handball (Saavedra et al, 2018), volleyball (Alexandru & Sabin, 2015), baseball (Otten & Barrett, 2013), and hockey (Kuhn et al., 2016). The interest in basketball game-related statistics has increased considerably in recent years (Canuto et al., 2022; Gasperi et al., 2020; Giovanini et al., 2021; Paulauskas et al., 2018; Stavropoulos et al., 2021). These data allow the performance of the teams to be examined in different frameworks which are important in terms of team dynamics and the coaching process (Sampaio & Leite, 2013). Several studies have investigated statistical data to separate the winning teams from the losing teams. In a study conducted in Spanish Men's Professional Basketball League, defensive rebounds were the only game-related statistic that distinguished between winning and losing teams (Angel-Gómez et al., 2008). According to a study conducted by Giovanini et al., (2021) defensive rebounds, assists, and 3-point shooting performance were crucial during the season phase, whereas defensive rebounds, assists, 2-point shooting performance, and 3-point shooting performance were crucial during the playoffs. Stavropoulos et al., (2021) found that assists, free throw attempts, successful free throws, and defensive rebound were essential in winning matches by examining the data of the 2019 World Men's Basketball Championship. According to Madarame (2018), assists were significant in both men's and women's games, while 2-point shooting percentage was significant in only women's games.

Home advantage is an important factor for team performance in basketball. Courneya and Carron (1992) stated that home teams win more than 50% of the games. According to a study conducted by Pollard and Gómez (2007), home teams won 61% of the games in Spain, 63% in France, and 66% in Italy and Greece. Spectator support, not having to travel, and being familiar with the court are considered to provide a psychological advantage to home teams (Pollard & Pollard, 2005) thus increasing their performance. In research by Angel-Gómez et al., (2008) for balanced games (final scores differences equal or below 12 points) defensive rebounds separated winning and losing teams while for unbalanced games (final score differences above 12 points) 2-point field goals, defensive rebounds and assists separated winners and losers. For all games defensive rebounds and assist were crucial for winning games. Dimitros et al., (2013) stated that although home teams performed better behind the 3-point line and had a higher number of assists, no game-related statistic differentiated winners and losers. Another study on the ACB basketball league found that in home games, 2-point performance separated winning and losing teams, and in away games, 2-point performance and assists discriminated between teams. (García et al., 2014). According to the findings of the Zhang et al., (2017) study, game location had no significant impact on player performance.

Statistical data is crucial to understand and interpret the dynamics of basketball. The correct interpretation of team statistics in the matches held throughout the season will be vital in the coaching process and affect the performance of the teams. Although studies on the game-related statistics of the Turkish professional basketball league have been done (Doğan et al.,

2016; Özdemir & Ballı, 2020), no prior research has investigated the game-related statistics in relation to game location. The purpose of this study was to analyze the game-related statistics that separate winning and losing teams in the Turkish Basketball Super League based on the game's location.

METHODS

Study Design

The Turkish Basketball Super League's 2020–2021 season featured 258 games, and statistics from those games were obtained. The data was extracted from the Turkish Basketball Federation's official box scores, which are available at https://www.tbf.org.tr/ligler/bsl-2020-2021/maclar. Game-related statistics used in the research are: 2-point field goals made (2pm), 2-point field goals attempted (2pa), 2-point field goal percentage (2pt%), 3-point field goals made (3pm), 3-point field goals attempted (3pa), 3-point field goal percentage (3pt%), free throws made (Ftm), free throws attempted (Fta), free throw percentage (Ft%), total rebounds (Trb), defensive rebounds (Drb), offensive rebounds (Orb), assists, steals, turnovers, blocks, fouls committed, points scored and points allowed. All statistics, with the exception of shooting percentages, were normalized based on the number of ball possessions after the game statistics were obtained from the official website (Sampaio & Janeira, 2003). Oliver's (2004) equation was used to calculate the ball possessions, offensive efficiency, and defensive efficiency:

- Ball Possessions = (Attempted Field Goals) – (Offensive Rebounds) + (Turnovers) – (0.4 * Attempted Free Throws)
- Offensive Efficiency = (Points Scored / Ball Possessions) * 100
- Defensive Efficiency = (Points Allowed / Ball Possessions) * 100

Statistical Analysis

The assumption of normality was checked and confirmed using the Kolmogorov-Smirnov test ($p>.05$) after normalizing the data according to ball possessions. To determine the univariate differences, an independent samples t-test was used. Following that process, a discriminant analysis was carried out to look at the game-related statistics that separate the winning and losing teams throughout all games, including at home and on the road. According to Tabachnick and Fidell (2001), structural coefficient values (SC) above .30 were taken into consideration when determining how much they contributed to discrimination. The leave-one-out classification was conducted for the validation of discriminant models. The significance value was 5%.

RESULTS

Table 1. Means, standard deviations, and univariate differences in all games, home games, and away games

Variables	All Games				Home				Away			
	Winning Teams		Losing Teams		Winning Teams		Losing Teams		Winning Teams		Losing Teams	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2pm[xyz]	39.03	7.58	33.49	7.40	38.20	7.47	33.46	7.80	40.21	7.61	33.51	7.13
2pa[xyz]	68.36	11.74	64.88	10.79	67.37	11.06	64.16	11.43	69.77	12.55	65.39	10.32
2pt%[xyz]	57.51	8.67	51.57	9.00	57.01	8.74	51.79	9.72	58.20	8.56	51.41	8.48
3pm[xyz]	17.00	5.19	13.90	4.68	17.58	5.12	14.50	5.16	16.19	5.21	13.47	4.27
3pa	43.75	9.67	42.70	8.98	44.60	9.80	43.90	9.77	42.55	9.39	41.85	8.30
3pt%[xyz]	39.16	9.72	32.65	8.87	39.73	9.41	33.03	9.43	38.35	10.13	32.39	8.47
Ftm[x]	26.39	14.29	23.59	12.84	26.96	15.08	24.31	13.59	25.59	13.14	23.08	12.31
Fta	34.54	18.43	32.30	16.94	35.15	19.77	33.28	18.44	33.67	16.40	31.61	15.82
Ft%[xy]	76.54	11.29	73.02	13.46	77.24	11.20	73.38	13.88	75.55	11.40	72.76	13.19
Trb[xyz]	64.20	12.11	57.03	12.58	64.25	12.39	56.66	13.60	64.13	11.76	57.28	11.84
Drb[xyz]	45.40	8.31	39.21	8.84	45.77	9.00	38.97	8.84	44.88	7.25	39.38	8.86
Orb	18.74	7.61	17.79	7.12	18.48	7.48	17.70	7.48	19.10	7.83	17.86	6.88
Assists[xyz]	37.82	8.94	31.27	8.36	38.17	9.13	32.35	8.21	37.33	8.68	30.51	8.41
Steals[xyz]	12.36	4.99	9.98	4.15	12.58	5.10	9.89	4.07	12.04	4.84	10.04	4.21
Blocks[x]	4.44	3.07	3.75	2.85	4.55	3.15	3.93	2.93	4.29	2.97	3.62	2.80
Turnovers[xyz]	20.44	6.07	23.13	6.28	20.58	5.85	22.95	6.43	20.26	6.39	23.27	6.18
Fouls	34.83	9.68	35.24	9.63	35.07	10.06	35.45	9.60	34.50	9.16	35.09	9.69
OE[xyz]	155.47	26.44	132.26	23.59	156.11	28.16	134.71	25.84	154.57	23.90	130.52	21.79
DE[xyz]	134.26	26.08	153.33	25.46	133.71	26.95	154.26	27.07	135.02	24.92	152.67	24.32

[x] Difference between winners and losers in all games that is statistically significant (p<.05). [y] Difference between winners and losers in home games that is statistically significant (p<.05). [z] Difference between winners and losers in away games that is statistically significant (p<.05).

Table 1 displays the results of independent samples t-tests for all games, home games, and away games. Winning teams had higher means for 2pm, 2pa, 2pt%, 3pm, 3pt%, Trb, Drb, assists, steals, turnovers, OE, and DE in all games, home, and away games (p<.05). While Ftm values were significantly different in all games, it did not differ in home and away games. In all games and home games winning teams had higher Ft% values. Analysis showed that block values were higher for winning teams in all games. No univariate differences were found for 3pa, Fta, offensive rebounds, and fouls (p>.05).

Table 2. Discriminant analysis structure coefficients (Sc) for all games, home games, and away games

Variables	All Games	Home	Away
2pm	**.341**	.274	**.416**
2pa	.142	.125	.176
2pt%	**.310**	.250	**.364**
3pm	.290	.264	.264
3pa	.052	.031	.036
3pt%	**.322**	**.312**	.296
Ftm	.095	.080	.091
Fta	.058	.043	.058
Ft%	.131	.137	.102
Trb	.268	.258	.264
Drb	**.333**	**.334**	**.305**
Orb	.059	.046	.078
Assists	**.349**	.292	**.365**
Steals	.239	.251	.204
Blocks	.107	.088	.107
Turnovers	.-201	-.171	-.219
Fouls	-.019	-.017	-.028
Eigenvalue	1,180	1,268	1,178
Wilks' Lambda	.459	.441	.459
Canonical Correlation	.736	.748	.735
Chi-square	394,336	203,550	193,066
p	<.05	<.05	<.05
Reclassification (%)	83.9	86	82.9

Note. Bold highlighted values are structure coefficients above .30.

Discriminant analysis results are shown in Table 2. The analysis could correctly classify 83.9%, 86% and 82.9% of cross-validated group cases of all games, home games and away games

respectively. All discriminant functions were statistically significant ($p<.05$). For all games structure coefficients for 2pm (SC = .341), 2pt% (SC = .310), 3pt% (SC = .322), defensive rebounds (SC = .333) and assists (SC = .349) were above .30. Results from home games showed the importance of 3pt% (SC = .312) and defensive rebounds (SC = .334). In away games 2pm (SC = .416), 2pt% (SC = .364), defensive rebounds (SC = .305) and assists (SC = .365) discriminated winning and losing teams.

DISCUSSION

The aim of this study was to determine which game-related data, when compared to game location (home or away), best distinguish between winning and losing teams in the Turkish Basketball Super League during the 2020–2021 season. Analysis results revealed that 2pm, 2pt%, 3pt%, Drb and assists differentiated between winning and losing teams.

Regardless of the game location, winning teams had more defensive rebounds than losing teams. Defensive rebounds are essential for winning games, according to earlier studies (Doğan & Ersöz, 2019; Garcia et al., 2013; Giovanini et al., 2021; Sampaio et al., 2010). Defensive rebounds are a key game-related statistic for team play. It prevents scoring chances for the offensive team and opens up opportunities for fast breaks for the defensive team. Players' positioning, technical abilities, and anthropometric attributes are crucial factors for rebounding (Zhang et al., 2018). Sampaio and Janeria (2003) stated that having tall and strong players in the team allows the team to take more defensive rebounds and create more fast-break chances thus allowing more points. Having players with better anthropometric attributes and technical knowledge about rebounding in the roster will allow the team to collect more defensive rebounds and create more scoring opportunities.

Results of the study showed that 2-point shooting performance (2pm and 2pt%) was an important factor for winning games. For all games, home games and away games winning teams had higher means. Results of the discriminant analysis highlighted the significance of 2-point shooting performance in both home and away games. These results are in line with the research conducted (Doğan & Ersöz, 2019; Giovanini et al., 2021; Ibañez et al., 2018). This difference in 2-point performance can be explained by the physical fitness level of the athletes and shot selection, which is a key principle for scoring.

3-point shooting has become an extremely important part of basketball in recent years (Mandić et al., 2019). Both tactical processes and physical preparation of the players might affect 3pt% (Gómez et al., 2016). 3-point shooting performance was an important game-related statistic for winning teams according to the analysis conducted on the data. Although winning teams had a higher 3pt% for all games, home games, and away games, discriminant analysis results showed that 3pt% was crucial for all games and home games. The structure coefficient value was below .30 for away games. The results of the study are in line with the studies conducted on different leagues (Conte et al., 2018; Doğan & Ersoz, 2019; Giovanini et al., 2021; Puente et al., 2015). Having higher 3pt% results in creating fewer defensive rebound chances for the opponents, reducing their ball possession, and scoring opportunities (Çene, 2018). The 3-point shooting performance difference between home and away teams can be explained by coaching processes, involvement of the crowd, and physical and mental preparation levels of the players.

Assists are a crucial element of team play and team cohesion (Hofler & Payne, 1997). A crucial game-related statistic that distinguishes the winning and losing teams was the number of assists, according to analysis results. This result is consistent with the investigations conducted (Doğan & Ersoz, 2019; Giovanini et al., 2021; Melnick, 2001; Özmen, 2016). Although in home games winning teams had higher assist values, discriminant analysis results indicated the importance of assists for winning away games. Ball distribution and shot selection are closely related to the team's assists. The importance of assists in away games can be explained by better ball distribution and shot selection.

CONCLUSION

The study's findings concluded that successful 2-point field goals, 2-point and 3-point percentages, defensive rebounds, and assists are crucial for winning games. In home games, winning teams performed better in defensive rebounds and 3-point percentages. In away games winning teams performed better in successful 2-point field goals, 2-point percentages, defensive rebounds, and assists. In basketball, game plans prepared according to the analysis of game-related statistics directly affect the performance of the teams. This reveals the importance of game-related statistics and performance analysts. To this end, the number and variety of courses given to students studying in the relevant departments of the Faculty of Sports Sciences about basketball games' statistical analysis can be increased. Game-related statistics analyzed by well-trained performance analysts can contribute positively to the tactical preparation process of the teams for the upcoming seasons.

Conflict of Interest: No potential conflict of interest was reported by the author.

Authors' Contribution: Research design, Data collection, Statistical analysis, Preparation of the article, AE.

Research Publication Ethic: This study complies with the Declaration of Helsinki. The study follows the "Council of Higher Education Scientific Research and Publication Ethics Directive" in terms of scientific, ethical, and citation requirements. The acquired data has not been tampered with, and this work has not been submitted for review to any other academic publication medium.

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